

## 1st Year

## 2009/2010 Curriculum

Students in First Year in 2009/2010 Academic Year			
			Pre- and/or Co-Requisites
FALL	1	AMAT 217	Calculus for Engineering and Scientists
	2	ENGG 205	Engineering Mechanics I
	3	ENGG 251	Design & Communications I
	4	MATH 211	Linear Methods
F or W	5	CHEM 209	General Chemistry for Engineers
	6	ENGG 201	Behaviour of Liquids, Gases and Solids
	7		Complementary Study (1 half-course equivalent)
WINTER	8	AMAT 219	Multivariable Calculus for Engineers
	9	ENGG 233	Computing for Engineers I
	10	ENGG 253	Design & Communications II
	11	PHYS 259	Electricity and Magnetism
			AMAT 217
			ENGG 251
			ENGG 205; co-req: AMAT 219

## 2010/2011 Curriculum

Students in First Year in 2010/2011 Academic Year			
			Pre- and/or Co-Requisites
FALL	1	AMAT 217	Calculus for Engineering and Scientists
	2	ENGG 200	Engineering Design and Communication
	3	MATH 211	Linear Methods I
F or W	4	CHEM 209	General Chemistry for Engineers
	5	ENGG 201	Behaviour of Liquids, Gases and Solids
	6	ENGG 202	Engineering Statics
	7	ENGG 233	Computing for Engineers I
	8		Complementary Study (1 half-course equivalent) (See Note 1)
WINTER	9	AMAT 219	Multivariable Calculus for Engineers
	10	ENGG 225	Fundamentals of Electrical Circuits and Machines
	11	PHYS 259	Electricity and Magnetism
			AMAT 217
			Not open to students with credit in ENGG 251 and 253
			Not open to students with credit in ENGG 205
			AMAT 217
			Not open to students with credit in ENGG 325, BMEN 327, or ENEL 341
			AMAT 217; MATH 211; co-req: AMAT 219

**Note 1:** Taking a complementary studies course in first year is optional, not required. All complementary studies courses must be taken prior to graduation.

## 2nd Year

**Software Engineering: Regular Program**

<b>FALL</b>	1	AMAT 307	Differential Equations for Engineers	AMAT 219; MATH 211 or 221
	2	ENCM 339	Programming Fundamentals	ENGG 233
	3	ENEL 353	Digital Circuits	
	4	ENGG 319	Probability and Statistics for Engineers	AMAT 219
	5	PHYS 369	Acoustics, Optics and Radiation for Engineers	AMAT 217; AMAT 219; PHYS 259
<b>F or W</b>	6		Complementary Study (1 half-course equivalent)	
<b>WINTER</b>	7	CPSC 319	Data Structures, Algorithms, and Their Applications(See Note 1)	ENCM 339
	8	ENCM 369	Computer Organization	ENCM 339; ENEL 353
	9	ENEL 327	Signals and Transforms	AMAT 307
	10	ENSF 409	Principles of Software Development	ENCM 339
	11	MATH 271	Discrete Mathematics	MATH 221

**Note1:** CPSC 331 may be used to satisfy the requirement for CPSC 319.

**Biomedical Specialization**

<b>BLK WK</b>		BMEN 103	Biomedical Engineers & Technology in Health Care	
<b>FALL</b>	1	AMAT 307	Differential Equations for Engineers	AMAT 219; MATH 211 or 221
	2	BMEN 319	Applied Statistics for the Experimental Sciences	AMAT 219
	3	BMEN 327	Electrical Circuits for Biomedical Engineers (See Note 1)	PHYS 259
	4	ENCM 339	Programming Fundamentals	ENGG 233
	5	ENEL 353	Digital Circuits	
<b>F or W</b>	6		Complementary Study (1 half-course equivalent)	
<b>WINTER</b>	7	BMEN 309	Anatomy and Physiology for Engineers	
	8	CPSC 319	Data Structures, Algorithms, and Their Analysis	ENCM 339
	9	ENCM 369	Computer Organization	ENCM 339; ENEL 353
	10	ENEL 327	Signals and Transforms	AMAT 307
	11	ENSF 409	Principles of Software Development	ENCM 339
	12	MATH 271	Discrete Mathematics	MATH 221

**Note 1:** BMEN 327 will not be offered in 2011/2012. Students who have not successfully completed BMEN 327 by the end of the Fall 2010 session will be required to complete ENGG 225.

**Note 2:** CPSC 331 may be used to satisfy the requirement for CPSC 319.

## 3rd Year

Regular Program				
<b>FALL</b>	1	CPSC 457	Principles of Operating Systems	CPSC 331; ENCM 369
	2	CPSC 471	Data Base Management Systems	CPSC 331
	3	SENG 301	Analysis & Des. of Large-Scale Software Sys	CPSC 331
	4	ENCM 511	Assembly Language Programming	ENCM 369
<b>F or W</b>	5,6	Complementary Study (2 half-course equivalents)		
<b>WINTER</b>	7	CPSC 441	Computer Communications	CPSC 331; one of: CPSC 325, 455 or ENCM 369
	8	SENG 401	Analysis & Des. Of Large-Scale Software Sys II	SENG 301
	9	SENG 403	Team Software Development	SENG 301
	10	SENG 471	Software Requirements Engineering	SENG 301
	11	SENG 437	Software Testing	SENG 301

Biomedical Specialization				
<b>FALL</b>	1	CPSC 471	Data Base Management Systems	CPSC 331
	2	PHYS 369	Acoustics, Optics and Radiation for Engineers	AMAT 219; PHYS 259
	3	SENG 301	Analysis & Des. of Large-Scale Software Sys	CPSC 331
	4	ENCM 511	Assembly Language Programming	ENCM 369
<b>F or W</b>	5,6	Complementary Study (2 half-course equivalents)		
	7	BMEN Core Elective (one half course equivalent)		
<b>WINTER</b>	8	CPSC 441	Computer Communications	CPSC 331; one of: CPSC 325, 455 or ENCM 369
	9	SENG 401	Analysis & Des. Of Large-Scale Software Sys II	SENG 301
	10	SENG 403	Team Software Development	SENG 301
	11	SENG 437	Software Testing	SENG 301
	12	SENG 471	Software Requirements Engineering	SENG 301

4th Year

Regular Program			
<b>BLOCK WK - FALL</b>	ENEL 107	ENCM/EL/SF Engineering 4th Yr. Block Course	4th year standing
<b>FALL</b>	1 ENEL 583 2 SENG 511	4th Yr. ENCM/EL/SF Team Design Project Part A Software Process Improvement	ENEL 107 One of: SENG 403 or 411 or CPSC 301 or 451
<b>F or W</b>	3 ENGG 513 4-7 8	The Role and Responsibilities of the Professional Engineer in Society Technical Electives (4 half-course equivalents) (See Note 1) Complementary Studies (1 half-course equivalent)	Final year standing in SSE
<b>WINTER</b>	9 ENEL 589 10 SENG 521 11 SENG 533	4th Yr. ENCM/EL/SF Team Design Project Part B Software Reliability and Software Quality Perf. Eval. and Testing of Non-Funct. Soft. Req. (See Note 1)	ENEL 583 SENG 437 or SENG 421 One of: SENG 301, ENCM 493, ENSF 409 or CPSC 301; one of: CPSC 457, ENSF 413 or ENCM 491
<b>Note 1:</b> Students who have completed ENCM 417 and ENCM 491 are not required to take SENG 533, but may elect to			

Biomedical Specialization- Thesis			
<b>BLOCK WK - FALL</b>	ENEL 107	ENCM/EL/SF Engineering 4th Yr. Block Course	4th year standing
<b>FALL</b>	1 ENEL 583 2 SENG 511	4th Yr. ENCM/EL/SF Team Design Project Part A Software Process Improvement	ENEL 107 One of: SENG 403 or 411 or CPSC 301 or 451
<b>F or W</b>	3 ENGG 513 4-6 BMEN 500 7 8, 9	The Role and Responsibilities of the Professional Engineer in Society Biomedical Engineering Research Thesis (3 half-course equivalents) Complementary Study (1 half-course equiv) Biomedical Engineering Technical Electives (2 half-course equivalents)	Final year standing in SSE
<b>WINTER</b>	10 ENEL 589 11 SENG 521 12 SENG 533	4th Yr. ENCM/EL/SF Team Design Project Part B Software Reliability and Software Quality Software Performance Evaluation (See Note 1)	ENEL 583 SENG 437 or 421 One of: SENG 301, ENCM 493, ENSF 409 or CPSC 301; one of: CPSC 457, ENSF 413 or ENCM 491
<b>Note 1:</b> Students who have completed ENCM 417 and ENCM 491 are not required to take SENG 533, but may elect to			

Biomedical Specialization- Project			
<b>BLOCK WK - FALL</b>	ENEL 107	ENCM/EL/SF Engineering 4th Yr. Block Course	4th year standing
<b>FALL</b>	1 ENEL 583 2 SENG 511	4th Yr. ENCM/EL/SF Team Design Project Part A Software Process Improvement	ENEL 107 One of: SENG 403 or 411 or CPSC 301 or 451
<b>F or W</b>	3 ENGG 513 4 BMEN 501 7 8,9	The Role and Responsibilities of the Professional Engineer in Society Biomedical Engineering Project (1 half-course equivalent) Complementary Study (1 half-course equiv) Biomedical Eng. and/or Software Eng. Technical Electives (2 half-course equivalents)	Final year standing in SSE
<b>WINTER</b>	10 ENEL 589 11 SENG 533  12 SENG 521	4th Yr. ENCM/EL/SF Team Design Project Part B Software Performance Evaluation (See Note 1)  Software Reliability and Software Quality	ENEL 583 One of: SENG 301, ENCM 493, ENSF 409 or CPSC 301; one of: CPSC 457, ENSF 413 or ENCM 491  SENG 437 or 421
<b>Note 1:</b> Students who have completed ENCM 417 and ENCM 491 are not required to take SENG 533, but may elect to			

## TECHNICAL ELECTIVES

### Software Engineering Approved Technical Electives

Select three half-course equivalents.

**Note 1:** CPSC 471 may be used as a tech. elective only by students whose programs did not include CPSC 471 as a required course. Students may not take CPSC 471 as a technical elective if they have already completed ENSF 519.31

**Note 2:** A maximum of three ENSF 519 courses can be selected as technical electives

**Note 3:** A maximum of one of BMEN 509 or BMEN 515 may be selected as a technical elective.

#### FALL

BMEN 515	Bioeng. Methods in Systems Biology & Physiology	AMAT 307
CPSC 453	Introduction to Computer Graphics	CPSC 331; MATH 221; AMAT 219
ENCM 517	Computer Arithmetic & Computational Complexity	ENCM 339
EDEL 525	Neuro-Fuzzy and Soft Computing	EDEL 327
EDEL 591	Individual ENCM/EL/SF Project	Formal approval from the project supervisor and course coordinator(s)

#### F or W

CPSC 457	Principles of Operating Systems	CPSC 331
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#### WINTER

BMEN 509	Introduction to Biomedical Imaging and Applications	AMAT 307; ENGG 233; one of: ENGG 319, BMEN 319 or ENME 419
CPSC 411	Compiler Construction	CPSC 331
ENCM 503	Digital Video Processing	EDEL 327; ENCM 339
ENCM 515	Digital Signal Processors	ENCM 369
EDEL 563	Biomedical Signal Analysis	EDEL 327
EDEL 599	Individual ENCM/EL/SF Project Part II	EDEL 591 and formal approval from the project supervisor and course coordinator(s)
SENG 513	Web Engineering	One of: SENG 403 or 411 or CPSC 451 or 301
SENG 541	Modifiability of Large-Scale Software	SENG 401

#### NOT OFFERED 2010/2011

ENCM 505	Parallel Computer Architectures	ENCM 369; one of: ENCM 493 or ENSF 443
EDEL 573	Telecomm and Computer Communications	ENGG 319 or BMEN 319 or EDEL 419
ENSF 519	Special Topics (See Note 2)	Consent from Department
ENSF 531	Modifiability of Large Scale Software	TBC
ENSF 545	Introduction to Virtual Reality	ENSF 409 or one of EDEL 409 or ENCM 493 & ENCM 369
SENG 501	Advanced Topics in Software Engineering	Consent from Department
SENG 523	Formal Methods	One of SENG 403 or 411 or CPSC 451 or 301

## SPECIALIZATION ELECTIVES

**Biomedical Specialization Core Electives**

3rd year students choose one of:

		Pre- and/or Co-Requisites
BMEN 405	Biological Tissue and System Mechanics	ENGG 317, BMEN 309
BMEN 407	Cell Culture and Tissue Engineering	BMEN 309
BMEN 409	Bioelectricity	BMEN 309, 327

**Approved Technical Electives: *Biomedical Specialization***

		Pre- and/or Co-Requisites	
<b>FALL</b>	BMEN 511	Biomaterials and Biocompatibility	BMEN 309; one of BMEN 405 or 407, or permission of instructor
	BMEN 513	Photogrammetric Techniques for Reconstruct. and Manipulation of Biomed Data	ENGG 233; MATH 211; and one of ENGG 319, BMEN 319 or ENEL 419
	BMEN 515	Bioeng. Methods in Systems Biology & Physiology	AMAT 307
	ENME 523	Biomechanics of Joints	4th year standing or consent of the Depart.
<b>F or W</b>	BMEN 519	Special Topics in Biomedical Engineering	Consent of BMES Durector or designate
<b>WINTER</b>	BMEN 509	Introduction to Biomedical Imaging and Applications	AMAT 307, ENGG 233, and one of ENGG 319, BMEN 319, or ENEL 419
	BMEN 517	Biomedical Device Development	Final-year standing in SSE
	ENCH 535	Principles of Biochemical Engineering	CHEM 357
	ENEL 563	Biomedical Signal Analysis	ENEL 327

**Note:** All technical electives may not be offered each year